ANNUAL REPORT 1965

FORT FRANCES

water pollution control plant

DIVISION OF PLANT OPERATIONS
Ontario Water Resources Commission

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to provide you with the 1965 Annual Report on the operation of the Fort Frances Water Pollution Control Plant, OWRC Project No. 60-S-59.

The report presents design data, outlines operating problems encountered during the year and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

D. S. Caverly,
General Manager.

ONTARIO WATER RESOURCES COMMISSION

801 BAY STREET

TORONTO 5

Members of the Town of Fort Frances Local Advisory Committee,
Town of Fort Frances.

Gentlemen:

I am pleased to provide you with the 1965 Annual Report for the Fort Frances Water Pollution Control Plant, OWRC Project No. 60-S-59.

We appreciate the co-operation you have extended to our Operations staff throughout the year, and trust that continuation of this close association will ensure even greater progress in the sphere of water pollution control.

Yours very truly,

B C Palmer

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report provides useful information on the operating efficiency of this project during 1965. It is intended to act as a guide in gauging plant performance. To implement that aim, it includes detailed statistical and cost data, a description of the project and a summary of its operation during the year.

Of particular interest will be the cost data, which show the total cost to the municipality and the areas of major expenditure.

The Regional Operations Engineer is primarily responsible for the preparation of the report, and has compiled and arranged the material. He will be pleased to answer any questions regarding it. Other groups, however, were involved in the production, and these include the statistics section, the Drafting Section of the Division of Sanitary Engineering and the Division of Finance.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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FORT FRANCES

water pollution control plant

operated for

THE TOWN OF FORT FRANCES

by

THE ONTARIO WATER RESOURCES COMMISSION

<u>DIVISION OF PLANT OPERATIONS</u>

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: A. C. Beattie
Operations Engineer: A. Clark

801 Bay Street Toronto 5

'65 REVIEW

This is the first full year of operation for the Fort Frances Water Pollution Control plant. Operation began in the spring of 1964 but operating difficulties with the flow meter have severely limited the amount of information available. Laboratory results are also lacking because normal shipping requires a long period of time and produces poor results and during winter months shipping of samples is impossible due to freezing problems.

Laboratory facilities are being set up so that chemical analyses can be made at the plant. The resultant information will be forwarded to Head Office.

The cost of treatment was $52.08 per million gallons. This figure compares favourably with similar treatment in other municipalities.

The average flow for the ten reported months of 1965 was 1.84 mgd or about 92% of design flow.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY
1956 – 1965

INCEPTION

In March, 1956, the Town of Fort Frances approached the Ontario Water Resources Commission to finance, construct and operate water pollution control facilities in the municipality.

The firm of W. L. Wardrop and Associates, Consulting Engineers, Winnipeg, Manitoba, was engaged to prepare plans and specifications for the project.

APPROVAL

The Ontario Municipal Board gave its approval in June, 1960.

CONSTRUCTION

Simkins Construction Company Limited, Winnipeg, Manitoba, completed construction of the east end interceptor sewers in November, 1963. The west end trunk interceptor sewers and the sewage pumping station were constructed by that Company and British-American Construction and Materials, Limited, also of Winnipeg, Manitoba. West end interceptor sewers were completed in January, 1964, and the pumping station in February, 1964. McNamara Construction Company of Ontario, Limited, Leaside, Ontario, completed construction of the water pollution control plant in April, 1964.

TOTAL COST

$1,870,378

R. A. SLETMOEN
CHIEF OPERATOR

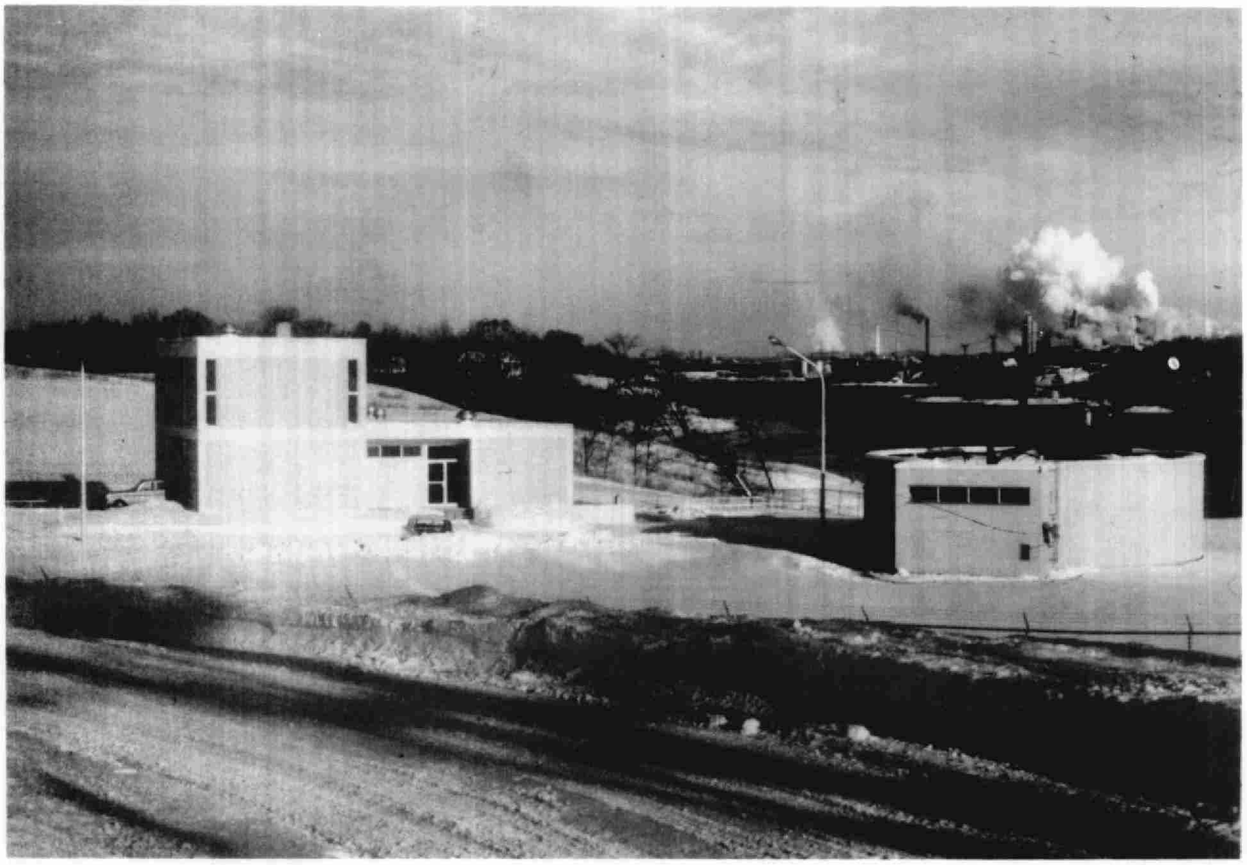
Project Staff

Operators

R. Easton G. McDiarmid

COMMENTS

Mr. Sletmoen has been chief operator since start-up in 1964. He has successfully completed the Basic and Intermediate Sewage Works Operators Course. It is anticipated that he will complete the Senior Course by the end of 1966.



Description of Project

INLET CHAMBER

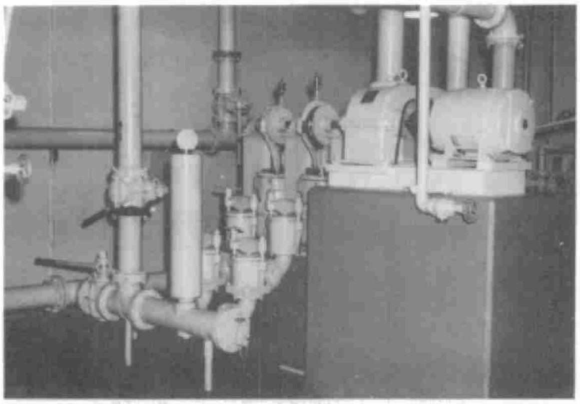
The Town sewer system discharges into the plant through an inlet sewer. The sewer terminates at a distribution chamber equipped with an overflow weir. This weir controls the flow to the plant in the event of excessively high flows due to heavy rain falls.

GRIT REMOVAL

From the inlet chamber the flow passes through an influent channel into the aerated grit chamber where the velocity of the flow is reduced to allow the heavier particles of grit and sand to settle to the bottom of the chamber. Air is blown into the chamber to keep the organic materials in suspension. A grab-bucket hoist periodically removes the accumulating grit and it is trucked away for disposal.

FLOW MEASUREMENT

The flow passes through a Parshall flume which measures the volume of sewage passing through the plant. The flow then passes through a shredding device which



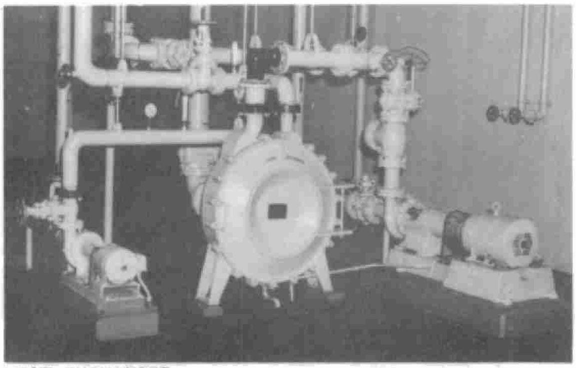
RAW SLUDGE PUMPS

automatically reduces the larger particles to a size suitable for handling in the treatment units. A bar screen is provided to screen the flow in the event of a breakdown of the comminuting equipment.

PRIMARY SEDIMENTATION

Following the grit removal and comminution processes the sewage is detained for approximately two hours, allowing the heavier organic particles to settle to the bottom of the tanks.

The settling tanks are equipped with revolving mechanisms which move the sludge to a central hopper and surface skimming mechanisms which collect the scum. The effluent from the settling tanks flows to the chlorine contact chamber.



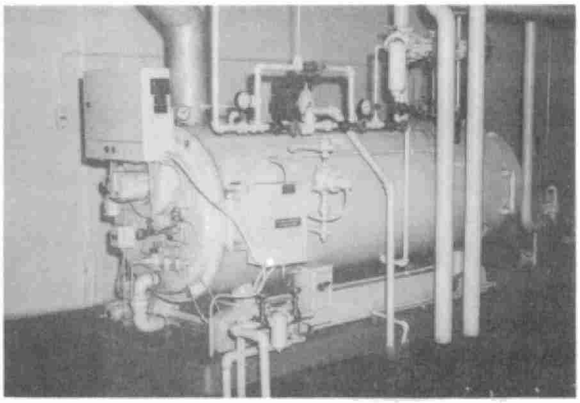
HEAT EXCHANGER

CHLORINE CONTACT CHAMBER

In the chlorine contact chamber, the flow is retained for a pre-determined period to allow overall contact of the water with the chlorine to reduce the bacterial count.

DIGESTION

The sludge and scum, removed by pumps from the primary sedimentation tanks, are transferred to the digester where they are allowed to decompose. The raw sludge is then submitted to a bacterial process which stabilizes the material producing a thick, black, odourless liquid which can be used as a soil conditioner, and a by-product, methane gas, which is used as fuel to heat the digester and plant buildings. Heat is applied to the tank's contents to maintain a temperature of 90° F which is required to expedite the process and mixers agitate the mixture to ensure overall treatment.



BOILER

GENERAL

The digested sludge and grit are removed by truck for disposal. Provision has been made for future expansion of the plant to full secondary treatment by the activated sludge process.

PROJECT COSTS

NET CAPITAL COST (Estimated)		$1,870,378.20
DEDUCT - Portion Financed by CMHC (Estimated)		1,249,176.99
Long Term Debt to OWRC	$	621,201.24
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1965	$	22,621.24
Net Operating	$	29,310.65
Debt Retirement		11,903.00
Reserve		13,168.00
Interest Charged		44,652.25
TOTAL	$	99,033.90

RESERVE ACCOUNT

Balance at January 1, 1965	$	8,779.00
Deposited by Municipality		13,168.00
Interest Earned		768.38
	$	22,715.38
Less Expenditures		-
Balance at December 31, 1965	$	22,715.38

MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	WATER
JAN	1363.14	1085.86			137.16					140.12	
FEB	2379.56	1118.02		475.42	432.00		165.55	31.02	43.32	114.23	
MARCH	2344.97	1097.40		471.96	471.96		55.99		4.74	714.88	
APRIL	2123.13	1226.97		411.88	356.94			11.88		65.46	50.00
MAY	2862.95	1650.95		424.45	233.28		186.00	89.61	10.72	242.94	25.00
JUNE	2257.56	871.97	103.44	1.34	671.22		114.84		122.61	372.14	
JULY	1963.64	1182.54			190.51	388.19	205.23	21.77		(24.60)	
AUG	2473.85	1172.64			596.32	388.19	113.12	24.59		128.99	50.00
SEPT	3612.87	1238.64		283.20	390.26		56.44	666.46	320.01	632.86	25.00
OCT	2671.40	1758.96			254.17	388.19	150.89		55.10	64.09	
NOV	2682.77	1257.84			643.95		169.10	336.92	31.93	193.03	50.00
DEC	2574.81	1215.24		519.14	433.24		136.92		118.34	151.93	
TOTAL	29310.65	14877.03	103.44	2115.43	4811.01	1164.57	1354.08	1182.25	706.77	2796.07	200.00

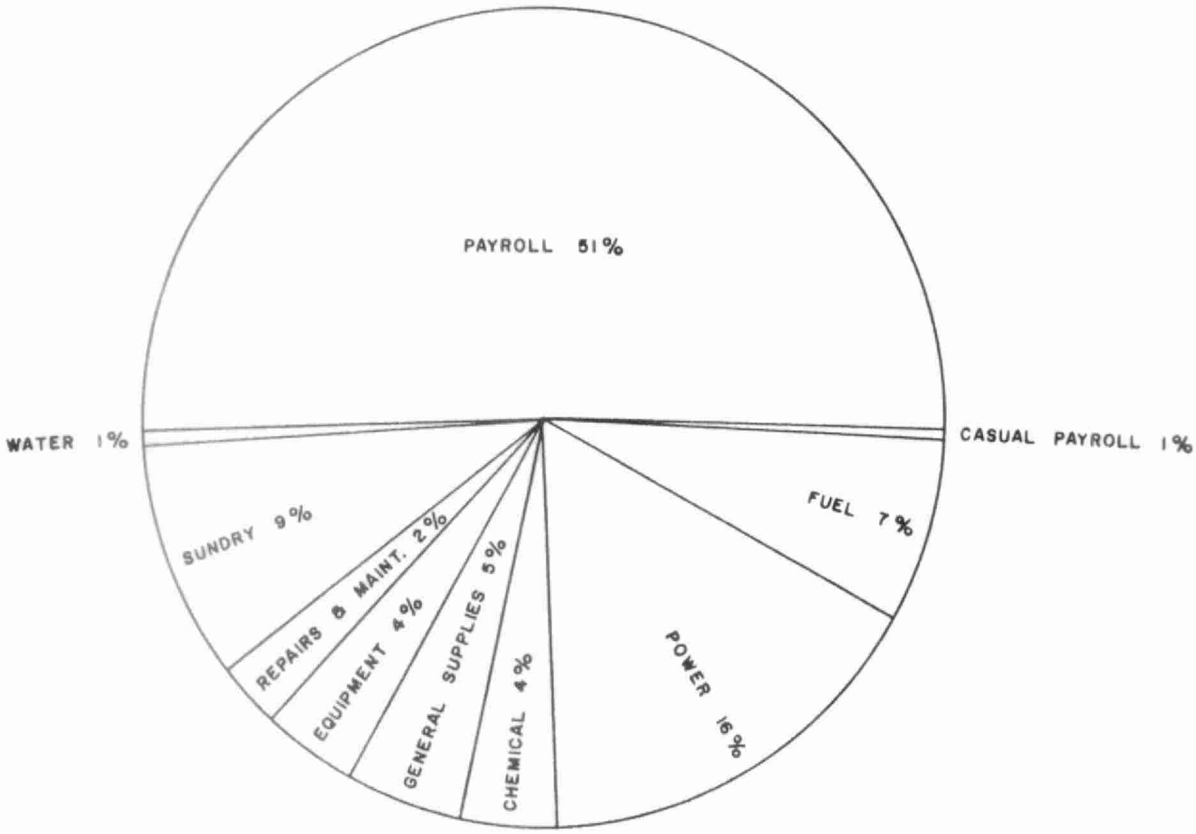
BRACKETS INDICATE CREDIT

YEARLY OPERATING COSTS

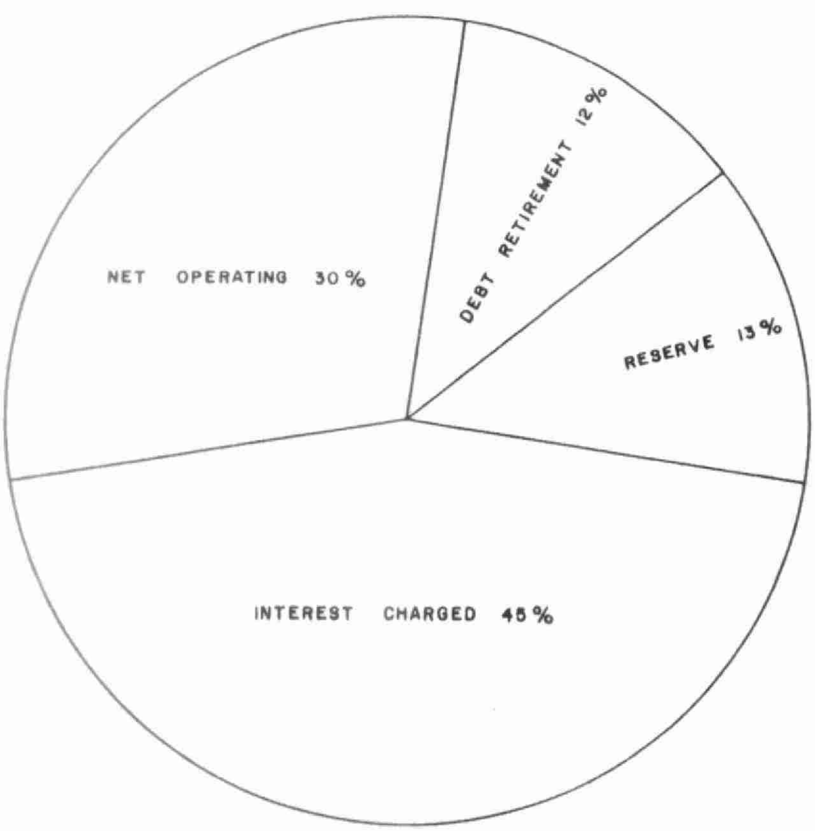
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS
1965	562.759	$29310.65	* $12.21	$52.08

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

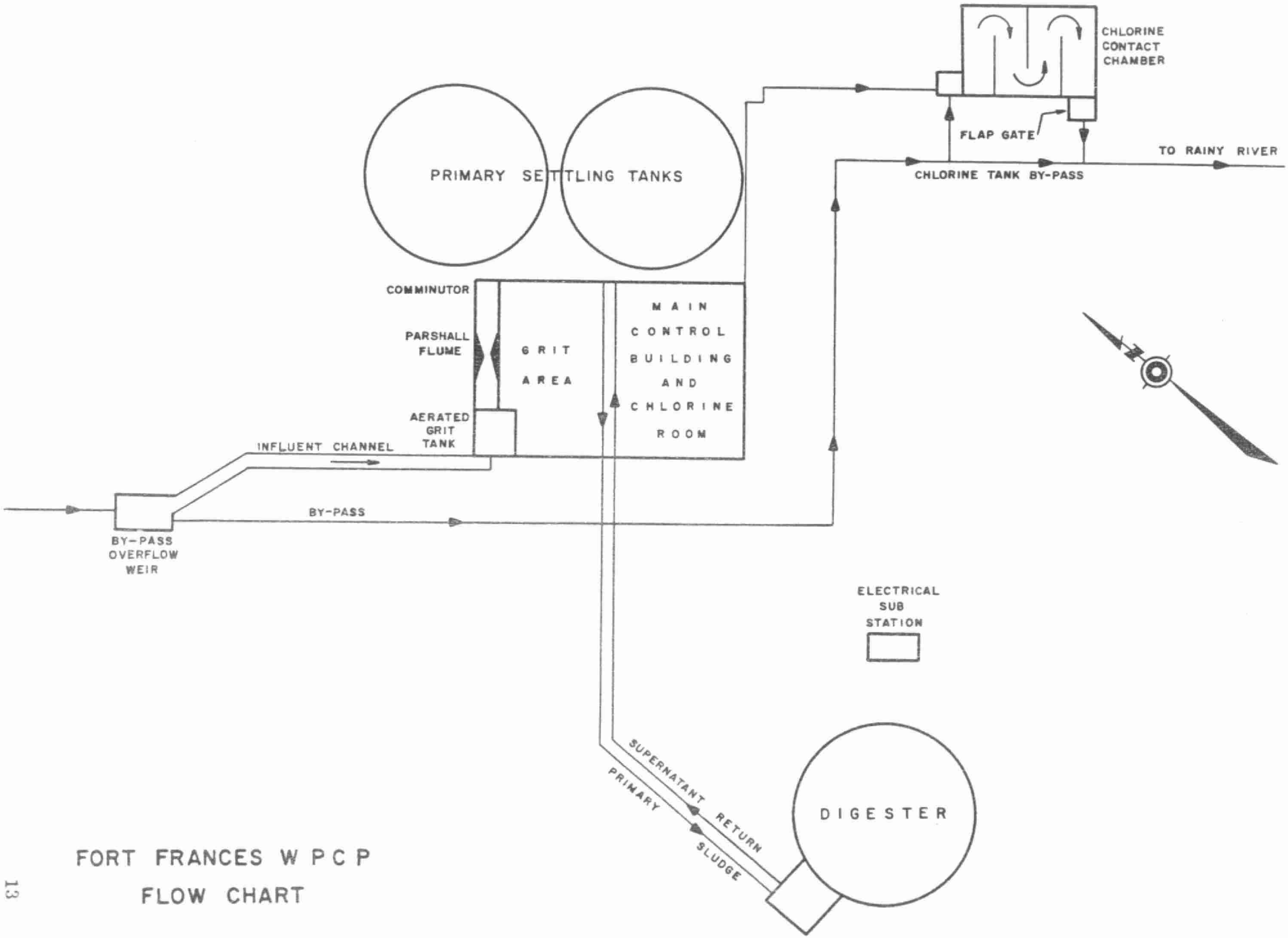
1965 OPERATING COSTS



TOTAL ANNUAL COST



Technical Section



FORT FRANCES W P C P
FLOW CHART

Design-Data

GENERAL

Type of Plant - Primary treatment.

Design Population - 12,000 persons.

Design Plant Flow - 2,000,000 gallons per day.

Per Capita Flow - 166 gpcd.

Five Day BOD -
Raw Sewage - 130 ppm
Removal - 40 %

Suspended Solids -
Raw Sewage - 180 ppm
Removal - 60%

Influent and Bypass Sewer

36 inch diameter.

Screening

Bar Screens 2 inches x 1/2 inch bars at 2 1/2 inch centres.

GRIT REMOVAL TANKS (AERATED)

Dimensions - 10 ft. 5 in. x 10 ft. 5 in. x 13 ft. 9 in. (SWD).

Capacity - 1515 cu. ft. or 9,440 gallons.
Retention - 6.8 min. @ 2.0 mgd.
- 2.3 min. @ 6.0 mgd.
A 10 cu. ft. clamshell bucket is used to remove the settled grit.

BLOWER

1 - Rootes-Connersville (Type RA1-58-AVM) rotary positive displacement blower rated at 100 cfm at 9 psi equipped with a Burgess Manning Snubber and driven by a variable speed (715 to 1430 rpm) 10 HP. GE electric motor.

PRIMARY SETTLING TANKS (TWO)

Dimensions - 40 ft. x 40 ft. x 10 ft. (SWD).
Capacity - 16,000 cu. ft. or 100,000 gallons each or 32,000 cu.ft. or 200,000 gallons total.
Retention - 2.4 hours @ 2.0 mgd.
- 0.8 hours @ 6.0 mgd.

Surface Settling Rate - 625 gallons per sq. ft. of surface area per day @ 2.0 mgd.
- 1875 gallons per sq. ft. of surface area per day @ 6.0 mgd.
Weir Overflow Rate - 9660 gallons per lin. ft. of weir per day @ 2.0 mgd.
- 28,980 gallons per lin. ft. of weir per day @ 6.0 mgd.

RAW SLUDGE PUMPS (TWO)

2 - Carter duplex plunger pumps each rated at 150 USGPM at a head of 210 ft. and each driven by a 20 HP. GE electric motor. Dominion Engineering reduction gears are used. These units also transfer the scum from wells to the digester and the digested sludge to the truck loading area.

CHLORINE CONTACT CHAMBER
FOUR-PASS TANK

Dimensions - 27 ft. x 20 ft. x 8.5 ft. (average liquid depth).
Capacity - 4590 cu. ft. or 28,600 gallons.
Retention - 20.6 min. @ 2.0 mgd.
- 6.86 min. @ 6.0 mgd.
1 - Wallace and Tiernan V-notch gas chlorinator (A-731) - feed rate: max. 400 pounds per 24 hours.

DIGESTER - FLOATING COVER

Dimensions - 40 ft. in diameter by 25 ft. (SWD).
Capacity - 31,400 cu. ft.
Storage - 2.6 cu. ft. per capita (12,000 persons).
1 - Chicago Pump Company horizontal Centrifugal pump, capacity 83 Imp. gpm at a head of 75 ft.

HEAT EXCHANGER

1 - Dorr-Oliver-Long spiral heat exchanger rated at 440,000 B.T.U. per hour.

Process Data

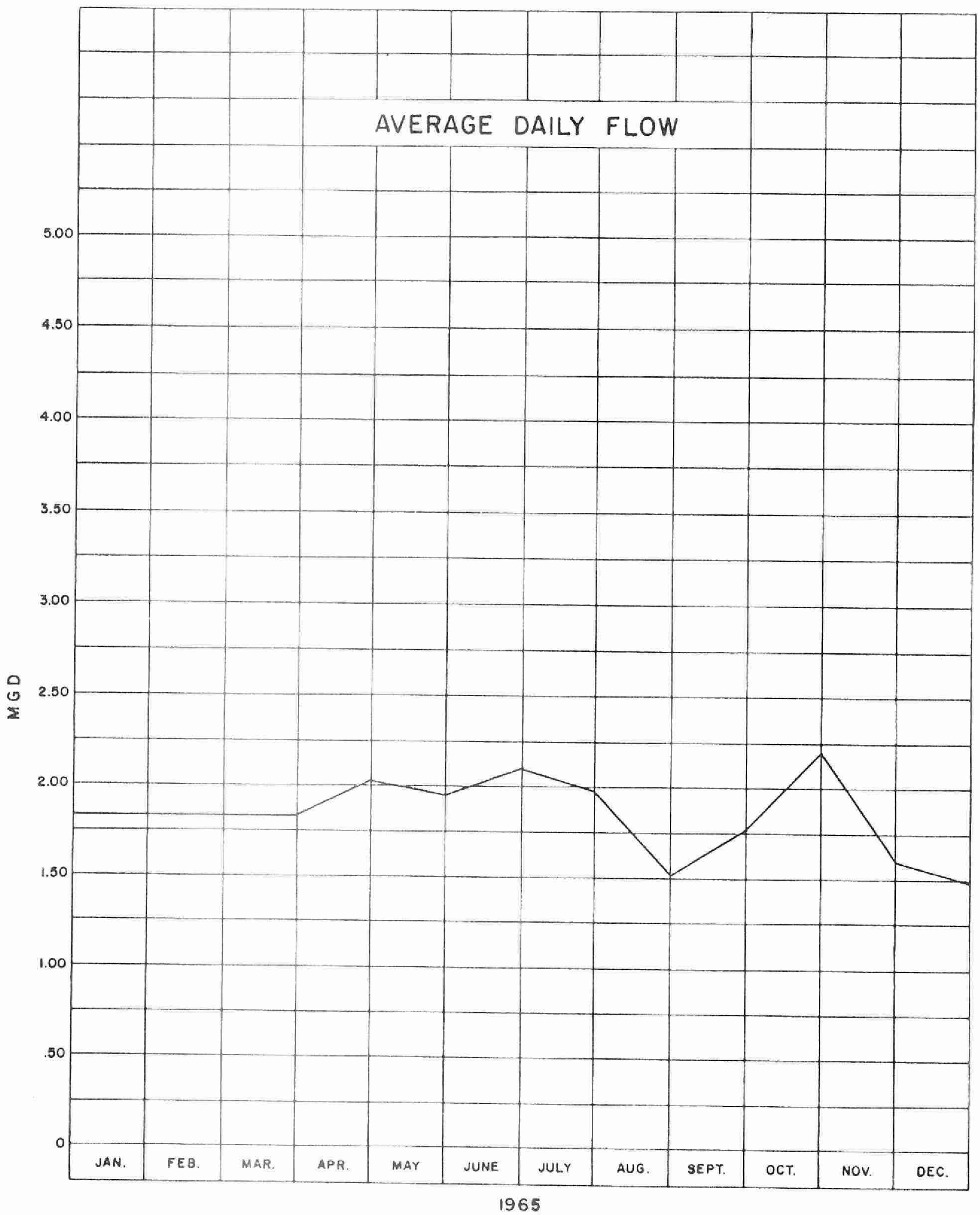
DAILY AVERAGE FLOW

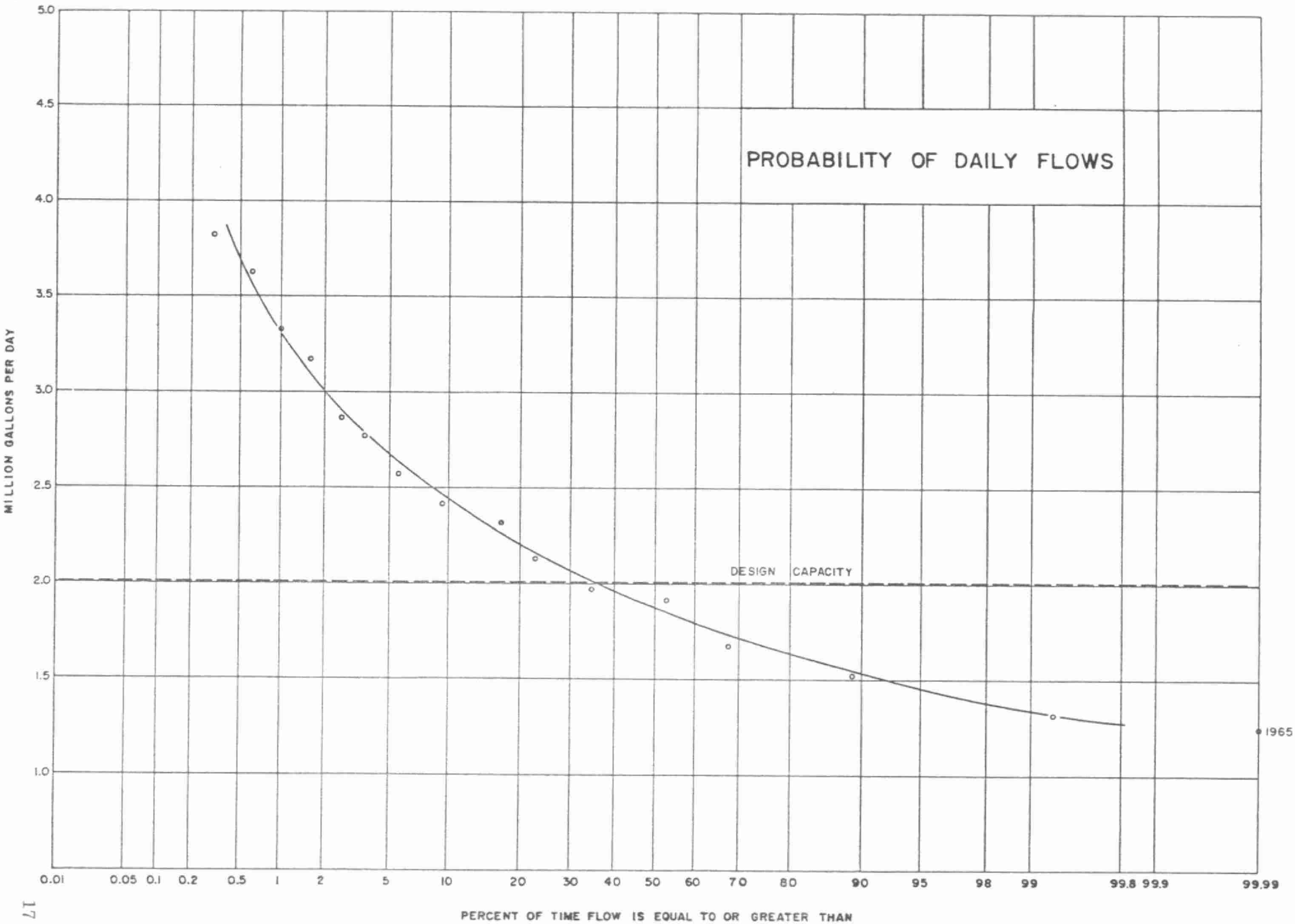
It can be seen that the flow is highest in the summer months. There is no frost in the ground at this time and infiltration into the sewer system is possible.

PROBABILITY PLOT

This graph shows that the plant is hydraulically loaded beyond its design capacity, approximately 30% of the time.

However, it would appear that this overloading is caused by surface water entering the sewer system.


AVERAGE DAILY FLOW
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
.50
0
MGD
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
1965


PROBABILITY OF DAILY FLOWS
MILLION GALLONS PER DAY
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
DESIGN CAPACITY
1965
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN

DIGESTER OPERATION AND GRIT REMOVAL

Month	Sludge to Digester 1000's cu. ft.	Gas Produced 1000's cu.ft.	Grit Removal in cu. ft.
January	-	-	-
February	-	-	-
March	4.31	-	-
April	4.33	-	20
May	5.25	-	90
June	3.92	-	12
July	3.95	97.39	50
August	4.50	93.36	25
September	8.15	131.13	70
October	8.15	76.74	90
November	4.52	93.31	50
December	4.41	57.98	50
Total	51.49	*549.91	457
Average	5.15	91.65	51

* Total for six months of data only.

COMMENTS

There are indications that the raw sewage is weak. This is shown by the small amount of raw sludge pumped to the digester and the low rate of gas production. The gas production shown is about one third of that normally expected.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (P.P.M)
JANUARY	–	–	–
FEBRUARY	–	–	–
MARCH	57.289	–	–
APRIL	60.766	–	–
MAY	60.447	–	–
JUNE	63.054	*1352	2.38
JULY	59.615	1899	3.18
AUGUST	46.725	1760	3.77
SEPTEMBER	52.749	1874	3.55
OCTOBER	68.339	** 901	3.72
NOVEMBER	47.804	–	–
DECEMBER	45.971	–	–
TOTAL	562.759	7786	–
AVERAGE	56.276	1557	3.24

* 27 days chlorination
** 11 days chlorination

COMMENTS

The plant effluent is chlorinated during the summer months. A total of 7786 pounds of chlorine were used at an average dosage of 3.24 ppm. This is a lower dosage than normal again an indication of weak sewage.

CONCLUSIONS

Absence of sufficient laboratory results prevents an accurate determination of plant loadings. However, although the hydraulic loads are high on occasion, analyses of raw sewage samples indicates a weak sewage. The strength of the raw sewage has been found by grab samples to be less than 100 ppm 5 day BOD.

It was not necessary to haul digested sludge in quantity in 1965 but it is expected that this will be necessary in subsequent years.

From the information available there are no indications that the capacity of the plant, in terms of organic loading, is being exceeded.

ONTARIO WATER RESOURCES COMMISSION